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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/688,047

10/17/2003

Chung Foong Tan

CS03-021

9186

7590

01/26/2006

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EXAMINER

GUERRERO, MARIA F

ART UNIT

PAPER NUMBER

2822

DATE MAILED: 01/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/688,047	TAN ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Maria Guerrero	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 03 January 2006.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-12, 14-19, 26 and 27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 14-19 and 26-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. This Office Action is in response to the Amendment filed November 14, 2005 and the Request for continued examination filed January 3, 2006.

#### **Status of Claims**

2. Claims 13 and 20-25 are canceled. Claims 1-12, 14-19 and 26-27 are pending.

#### ***Continued Examination Under 37 CFR 1.114***

3. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on January 3, 2006 has been entered.

#### ***Claim Rejections - 35 USC § 112***

4. Claims 1-12 and 14-19 and 26-27 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "said bulk silicon layer" in lines 11-12. There is insufficient antecedent basis for this limitation in the claim.

Claim 6 recites the limitation "said bulk silicon layer" in lines 11-12. There is insufficient antecedent basis for this limitation in the claim.

Claim 14 recites the limitation "said bulk silicon layer" in lines 11-12. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 3, 5-7, 9, 11-12, 14, 16, 18-19 and 26-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mansori et al. (US 6,830,980) in view of Yeo et al. (US 6,492,216) (of record) (as understood by the examiner in view of the rejection under 35 U.S.C. 112, second paragraph).

6. Mansori et al. shows providing a bulk silicon substrate (12), depositing a carbon-doped silicon layer (20) by chemical vapor deposition on the bulk silicon substrate (12),

Art Unit: 2822

and growing an epitaxial silicon layer (21) overlying the carbon-doped silicon layer (20) to provide a starting wafer for integrated circuit fabrication (Fig. 1-3, col. 5, lines 3-30). Mansori et al. teaches forming a gate electrode on the starting wafer (col. 8, lines 18-25). Mansori et al. discloses implanting LDD and source/drain regions in the starting wafer adjacent to the gate electrode (col. 8, lines 18-36).

7. Furthermore, Mansori et al. describes implanting a heavy ion (indium or antimony) to form halo implants adjacent to the LDD regions and underlying the gate electrode (Fig. 16-17, col. 1, lines 28-40, col. 8, lines 25-40). Mansori et al. shows the halo implants extending to an interface between the epitaxial silicon layer and the carbon-doped silicon layer (Figs. 15-17, col. 8, lines 25-40). Mansori et al. teaches the carbon-doped silicon layer having a thickness about 10-1000 Angstroms, for example about 100-500 Angstroms (col. 5, lines 2-30). Mansori et al. shows the epitaxial silicon layer having a thickness about 400-500 Angstroms (col. 5, lines 29-32).

8. Mansori et al. teaches the carbon-containing region being formed to inhibit diffusion of dopants during fabrication (Abstract, col. 2, lines 19-60, col. 4, lines 25-47). Therefore, the purposed of prevent end of range secondary defect formation is inherently disclosed by Mansori et al.

9. Mansori et al. does not specifically show implanting the source and drain regions extending into the bulk silicon substrate. However, Yeo et al. teaches implanting the source and drain regions extending into the bulk silicon substrate (Fig. 4-5, col. 5, lines 1-16).

10. Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify Mansori et al. reference by including the step of implanting the source and drain regions extending into the bulk silicon substrate as taught by Yeo et al. in order to provide a MOSFET with improve carrier transport properties and with increased device performance (Yeo et al., Abstract).

11. Claims 2, 4, 8, 10, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mansori et al. (US 6,830,980) and Yeo et al. (US 6,492,216) as applied to claims 1, 3, 5-7, 9, 11-12, 14, 16, 18-19 and 26-27 above, and further in view of Takahashi (U.S. 6,743,704).

Regarding claims 2, 4, 8, 10, 15 and 17, the combination of Mansori et al. and Yeo et al. describes the carbon concentration of about 0.1 atomic percent or more (Mansori et al., col. 5, lines 10-15).

The combination of Mansori et al. and Yeo et al. does not specifically show the carbon content of up to 0.5% as claimed. The combination of Mansori et al. and Yeo et al. does not specifically describe the chemical vapor deposition being at reduce pressure. However, Takahashi shows depositing a carbon-doped silicon layer by reduce pressure chemical vapor deposition and having a carbon content of up to 0.5% (col. 6, lines 8-15, 30-37).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the combination of Mansori et al. and Yeo et al. by specifying the carbon content of up to 0.5% and the chemical vapor deposition being at reduce pressure as taught by Takahashi because Mansori et al. suggested that the

Art Unit: 2822

carbon concentration could be more than 0.1 atomic percent (Mansori et al., col. 5, lines 10-15). There is not evidence of criticality; therefore, it is not inventive to discover the optimum or workable ranges by routine experimentation." In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP § 716.02 - § 716.02(g).

### ***Response to Arguments***

12. Applicant's arguments with respect to claims 1-12, 14-19 and 26-27 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Maria Guerrero whose telephone number is 571-272-1837.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on 571-272-2429. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*Maria Guerrero*  
**MARIA F. GUERRERO**  
**PRIMARY EXAMINER**